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PROBLEMS.

22. Proposed by G. B. M. ZERR, A. M., Principal of High School, Staunton, Virginia.

Decompose into the sum of two squares the product $5\times13\times61$.

23. Proposed by J. M. COLAW, A. M., Principal of High School, Monterey, Virginia.

Find three positive integral numbers such that the *product* of the first and the sum of the others is a square and the *sum* of their cubes is a square.

24. Proposed by F. P. MATZ, M. Sc., Ph. D., Professor of Mathematics and Astronomy in New Windsor College, New Windsor, Maryland.

Solve *generally*: The sum of the cubes of n consecutive numbers is a square. Determine the numbers, when $n=2$, $n=3$, $n=4$, and $n=5$.

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AVERAGE AND PROBABILITY.

Conducted by B. F. FINKEL, Kidder, Mo. All contributions to this department should be sent to him.

SOLUTIONS TO PROBLEMS.

12. Proposed by G. B. M. ZERR, A. M., Principal of High School, Staunton, Virginia.

A large plane area is ruled by two sets of parallel equidistant straight lines, the one set perpendicular to the other. The distance between any two lines of the first set is a; the distance between any two lines of the second set is b. If a regular polygon of $2n$ sides be thrown at random upon this area, find the chance that it will fall across a line, the diameter of the circum-circle of the polygon being less than a or b.

I. Solution by the PROPOSER.

Let $2r$ be the length of the diagonal of the polygon, θ its inclination to the length a.

Then if the centre of the polygon falls anywhere on the area $\{ab-(a-2r\cos\theta)(b-2r\cos\theta)\}$ it will fall across a line.

The limits of θ are 0 and $\frac{\pi}{2n}$.

$$\therefore \text{Chance}=p=\frac{\int_0^{\frac{\pi}{2n}}\{ab-(a-2r\cos\theta)(b-2r\cos\theta)\}d\theta}{\int_0^{\frac{\pi}{2n}}ab\,d\theta}.$$

$$p=\frac{2r(a+b)\sin\frac{\pi}{2n}-\frac{\pi r^2}{n}-r^2\sin\frac{\pi}{n}}{\frac{\pi ab}{2n}}$$